

KL UNIVERISTY
FIRST SEMESTER 2010-11
Course Handout
Academic Division

Dated: 07-07-2010

Course No. : CS C205
Course Title : Computer Graphics through C++
Course Structure : 3-0-2
Course coordinator : Mr K V D Kiran
Instructors : Mr K Subba Rao, Mr K V D Kiran

1. Course Description:

Computer Graphics is a study of the hardware and software principles of interactive raster graphics. Topics include an introduction to the basic concepts, 2-D and 3-D modeling and transformations, viewing transformations, projections, rendering techniques, graphical software packages and graphics systems. Students will use a standard computer graphics API to reinforce concepts and study fundamental computer graphics algorithms.

2. Scope and Objective of the Course:

This course is designed for all second year B.Tech. Computer degree students. This course is intended to provide engineering students with a background concepts and principles of graphics.

This textbook is aimed at the beginner of Computer graphics who is interested in merely using a package as a black box to carry out certain tasks by giving out certain commands.

The book aims to provide the background information on how a computer handles graphics, the logic and computational involved in the various processes for the input and output and brief description of relevant Hardware and software.

It covers just enough of variety and number of topics related to mathematics and graphical algorithms and to make a book as self contained

- 1) The goal of the Computer graphics course is to learn about Video display devices, Color Monitors and input devices.
- 2) The course aims to introduce Computer graphics primitives and Circle and parallel algorithms.
- 3) Students will be able to learn the programming syntax, understand the basic needs of graphics applications, and technologies for computer applications development.
- 4) Understand the Line functions and Ellipse generating algorithms.
- 5) Grasp the basic elements of two-dimensional Geometric transformations.
- 6) Design and develop a complete structure and hierarchical modeling and object representation.
- 7) To understand Coordinates and Clipping Algorithms.

After the successful completion of this course, the students should be able

1. Familiar with different technologies and programming languages such as C/C++
2. To develop algorithms which are secure and dynamic in nature and viewing and modeling the transformations.
3. Students will have an understanding of 2D graphics and algorithms including: line drawing, polygon filling, clipping, and transformations. They will be able to implement these. Assessed by tests and programming assignments.
4. Students will understand the concepts of and techniques used in 3D computer graphics, including viewing transformations, hierarchical modeling, color, lighting and texture mapping.

3. Books:

(i) Textbook:

- a. 1. Donald Hearn, M. Pauline Baker, "Computer Graphics", 2nd Edition PHI Publications, 2008.

(ii) Reference Book:

- a. David F. Rogers; "Procedural Elements for Computer Graphics"; TMH, 2006
- b. J. D. Foley, S. K. Van Dam, F. H. John; "Computer Graphics: Principles & Practice in C"; Pearson, 2001
- c. Francis S. Hill Jr; "Computer Graphics using Open GL"; Pearson Education, 2008.

4. Syllabus:

UNIT I: Over view of Graphics systems: Video Display Devices- Raster Scan systems-random scan systems-Graphics monitors and workstations-Input devices-hard copy devices-Graphics software. **Output primitives:** Points and Lines-Line Drawing Algorithms- Loading the Frame buffer- Line function- Circle- Generating Algorithms- Ellipse Generating Algorithms- Other Curves- Parallel Curve Algorithms-Curve Functions-Pixel Addressing-Filled Area Primitives-Filled Area Functions- Cell Array- Character Generation.

UNIT II: Attributes of Output Primitives: Line and Curve Attributes-Color and Gray scale levels- Area Fill Attributes, **Two Dimensional Geometric Transformations:** Basic Transformations- Matrix Representations-Homogeneous Coordinates-Composite Transformations-Other Transformations-Transformations between Coordinate Systems- Affine Transformations-Transformation Functions- Raster methods for Transformations.

UNIT III: Two Dimensional Viewing: The viewing Pipeline-Viewing Coordinate Reference Frame-Window-to-Viewport Coordinate Transformation-Two Dimensional Viewing Functions-Clipping Operations-Point Clipping-Line Clipping-Polygon Clipping-Curve Clipping- Text and Exterior Clipping. **Structure and Hierarchical Modeling:** Concepts of Structures and Basic models-Editing - Hierarchical Modeling with Structures-GUI and Interactive Input Methods-Windows and Icons- Virtual Reality Environments.

UNIT IV: Three Dimensional Concepts and Object representations: 3D display methods-3DGraphics-Polygon Surfaces- Curved Lines and Surfaces, Bezier Curves and Surfaces- B Spline Curves and Surfaces.

UNIT V: Three Dimensional Geometric and Modeling Transformations: Translation-Rotation-scaling-Other Transformations-Composite Transformations-3D Transformation Functions-Modeling and Coordinate Transformations. **Three Dimensional Viewing:** Viewing Pipeline- Viewing Coordinates- Projections-View Volumes- General Projection Transformations-Clipping-Hardware Implementations-Three Dimensional Viewing.

5.Course Plan:

Lec No.	Learning Objective	Topics to be covered	Reference
1	Introduction	Overview of Computer Graphics systems	T1 P.36-45
2	Introduction of graphics software	Overview of Computer Graphics systems	T1 P-46-85
3	Learn Points and lines	Graphics primitives	T1 84-94
4	Study of input devices	Overview of Computer Graphics systems	T1 95-110
5	Gain knowledge on DDA and Parallel	Line Algorithms	T1 111-114
6	Trained on Pixel addressing	Ellipse Algorithms	T1 117-131
7	Find out scan line polygon	Circle Algorithms	T1 95-110
8	Introduction of fill area functions	Filled area Primitives	T1 111-114
9	Learn cell array concepts	Filled area Primitives	T1 117-131
10	Study of Flood fill algorithms	Filled area Primitives	T1 126-130
11	Introduction of Line attributes	Line & Curve attributes	T1 144-149
12	Learn curve attributes	Color and Area Fill attributes	T1 150-162
13	Study of area fill attributes	Character attributes	T1 174-175
14	Gain knowledge on Translation,Rotation,S caling	Basic Transformations	T1 184-187
15	Trained on Matrix representations	Matrix representations & Homogeneous coordinates	T1 188-192

16	Find out Reflection, Shear	Composite Transformations	T1 193-194
17	Introduction of coordinate systems	Composite Transformations	T1 195-201
18		Other Transformations,	PPT
19		Affine & Coordinate Transformations	PPT
20		Raster method for transformations Functions	PPT
21	Introduction to Viewing Pipeline	The viewing Pipeline Viewing Coordinate Reference Frame	T1 217-220
22		Window-to-View Port Coordinate Transformation	PPT
23		Two Dimensional Viewing Function	T1 222-233
24	Sutherland clipping Line Algorithms	Clipping Operations, Point clipping Clipping Operations, Point clipping	T1 237-243
25	Learn Sutherland polygon clipping	Line, Polygon Clipping Curve and text clipping	T1 244-245
26	Inserting elements Symbol hierarchies	Structures concepts, Editing Structures	T1 250-254
27	Local coordinates	Basic Modeling Concepts	T1 255-258
28	Modeling transformations	Hierarchical modeling	T1 265-269
29-31	Study of Parallel projection	3D display methods & Parallel projection Depth Cueing	T1 297-299
32-33	Gain knowledge on 3D Concepts	Perspective projection & Visible line and surface, Identification, Surface rendering	T1 299-302
34	Trained on Design Tech	Three dimensional graphics, Polygon surfaces Curved Lines, Quadric surfaces	T1 305-311
35-36	Find out Cubic, Peroidic Curves	Bezier Curves, B-Spline Curves and surfaces	T1 327-344
37-38	Introduction to 3DModeling concepts	Translation-Rotation-scaling	T1 408-420, PPT
39-41	Study about viewing coordinates	Composite Transformations, Transformation Functions	T1 423, PPT
42-44	Trained on view volumes	Three Dimensional Viewing: Viewing Pipeline, Viewing Coordinates- Projections- View Volumes-	T1 438, PPT
45	Learn 3D Viewing concepts	Clipping Concepts, Hardware Implementations Three Dimensional Viewing	T1 456-464PPT

6.Self learning material:

Unit	Topic	Source
I	Loading the Frame buffer	Interactive Computer Graphics
I	Line function	Interactive Computer Graphics
I	Parallel Curve Algorithms	Interactive Computer Graphics
I	Curve Functions	Interactive Computer Graphics
I	Pixel Addressing	Interactive Computer Graphics
II	Area Fill Attributes	Computer Graphics: Principles & Practice in C
II	Raster methods for Transformations	Computer Graphics: Principles & Practice in C
III	Point Clipping	Computer Graphics: Principles & Practice in C
III	Line Clipping	Computer Graphics: Principles & Practice in C
III	Polygon Clipping	Computer Graphics: Principles & Practice in C
III	Curve Clipping	Computer Graphics: Principles & Practice in C
III	Interactive Input Methods	Computer Graphics: Principles & Practice in C
IV	3DGraphics	Donald Hearn, M.Pauline Baker
IV	Bezier Curves	Donald Hearn, M.Pauline Baker
IV	Bezier Surfaces	Donald Hearn, M.Pauline Baker
V	Modeling and Coordinate Transformations	Donald Hearn, M.Pauline Baker
V	Projections-View Volumes	Donald Hearn, M.Pauline Baker
V	General Projection Transformations	Donald Hearn, M.Pauline Baker

7.Evaluation Scheme:

Component	Duration (minutes)	% Weightage	Marks	Date & Time	Venue
Test-1	50 Min	7.5	10	14-08-2010 9.30 to 10.20 A.M	CSE002, 102 103, 202, 209, 309, NSH
Test-2	50 Min	7.5	10	18-09-2010 9.30 to 10.20 A.M	CSE002, 102 103, 202, 209, 309, NSH
Assignment submission		3.75	5	Continuous	
Assignment Test	50 Min	3.75	5	30-10-2010 9.00 to 10.20 A.M	CSE002, 102 103, 202, 209, 309, NSH
Quiz	30 Min	3.75	5	30-10-2010 9.00 to 10.20 A.M	CSE002, 102 103, 202, 209, 309, NSH
Regular Lab Evaluation	Continuou s	12.5	50		
Comprehensive Lab Exam	3 Hrs	10	40		
Comprehensive Exam	3 Hrs	45	60		
Attendance for Theory & Tutorial		3.75	5	Continuous	
Attendance for Lab		2.5	10	Continuous	

8. Chamber consultation hour: Informed in the class in first week.

9. Notices: All notices regarding the course will be put in E-learning website.

Course Coordinator